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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/031,408	01/18/2002	Kenji Tsukada	Q68137	2132

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2100 Pennsylvania Avenue NW
Washington, DC 20037-3202

EXAMINER

LIANG, LEONARD S

ART UNIT	PAPER NUMBER
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2853

DATE MAILED: 10/21/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/031,408

Applicant(s)

TSUKADA ET AL.

Examiner

Leonard S Liang

Art Unit

2853

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-54 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-12, 14, 22-32 and 36-54 is/are rejected.
- 7) ☒ Claim(s) 13, 15-21 and 33-35 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 April 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

2. Claim 46 is objected to because of the following informalities: Claim 46 states "An ink jet recording apparatus comprising: a recording head of jetting ink drops; an ink cartridge of feeding ink to said recording head..." This is grammatically incorrect. It will be construed that the claim should state "An ink jet recording apparatus comprising: a recording head of jetting ink drops; an ink cartridge of feeding ink to said recording head..." Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

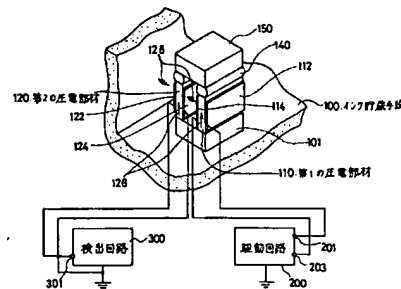
3. Claims 1, 8-9, 46-48, 51 are rejected under 35 U.S.C. 102(b) as being anticipated by Mikinobu (JP Pat 07137291).

Mikinobu discloses:

- {claim 1} ink consumption detection method (Detailed Description page 1, lines 3-4) using a piezo-electric device (Detailed Description page 1, lines 32-38) during a non-recording state of the recording head (Detailed Description page 1, lines 7-13)
- {claim 46} recording head jetting ink drops (Detailed Description page 1, lines 3-4; an ink cartridge for feeding ink (Detailed Description page 1, lines 7-13); piezo-electric device (as taught in claim 1); control device (as taught in claim 1)

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- {claims 8 and 47} piezo-electric device detects changes in acoustic impedance, thereby detecting the ink consumption condition in the ink container (Detailed Description page 1, lines 36-38; page 2, line 1)
- {claims 9 and 48} piezo-electric device has a vibration part, and the piezo-electric device detects changes in the acoustic impedance on the basis of counter electromotive force generated by residual vibration remaining in the vibration part, thereby detecting the ink consumption condition in the ink container (Detailed Description page 1, lines 36-38; page 2, line 1)
- {claim 51} carriage moving with the recording head and the ink cartridge, both of which are loaded on the carriage (figure 1, references 110, 120)



Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2-3, 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mikinobu (JP Pat 07137291) in view of Shinada et al (US Pat 5132711).

Mikinobu discloses, with respect to claims 2-3 and 36, an ink consumption condition detection method (as taught in claim 1).

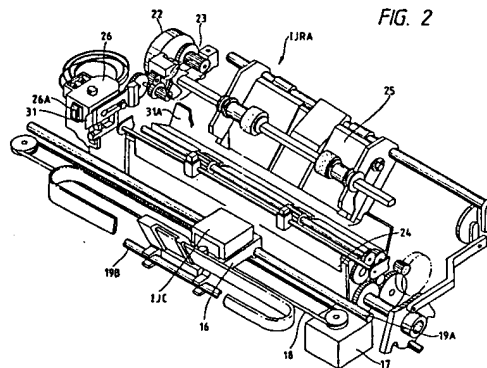
Mikinobu differs from the claimed invention in that it does not disclose:

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- {claim 2} maintenance operation for cleaning the recording head
- {claim 3} operation for feeding or ejecting a recording medium
- {claim 36} ink container is an ink cartridge loaded on the ink jet recording apparatus in a removal state

Shinada et al discloses:

- {claim 2} wiping member (figure 2, reference 31; column 2, lines 62-64)



- {claim 3} paper feed unit (figure 2, reference 25; column 2, lines 43-45)
- {claim 36} ink container is removable (figure 2, reference IJC)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Shinada et al into the invention of Mikinobu so that there is a maintenance operation, a feeding/ejecting operation, and a removable ink cartridge. The motivation for the skilled artisan in having a wiping member is to gain the benefit of cleaning the print head (column 2, lines 62-64). The motivation for the skilled artisan in having a paper feed unit is to gain the benefit of forming a desired image on a recording surface (column 2, lines 43-45). The motivation for the skilled artisan in having a removable ink container is to gain the benefit of being able to switch cartridges when one runs out of ink, which is disadvantageous (column 1, lines 30-35).

5. Claims 4-5, 37-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mikinobu (JP Pat 07137291) in view of Fumiyuki (JP Pat 10323997).

Mikinobu discloses, with respect to claims 4 and 37-42, an ink consumption condition detection method (as taught in claim 1).

Mikinobu differs from the claimed invention in that it does not disclose:

- {claim 4} ink condition detected when power of recording apparatus is turned on
- {claim 5} ink condition is detected when the recording apparatus is turned off

- {claim 37} consumption condition calculation process
- {claim 38} ink level is detected based on either a calculated result information of the ink consumption condition in the ink container calculated by the consumption condition calculation process or a measured result information of the ink consumption condition in the ink container measured by the piezo-electric device
- {claim 39} when an ink residue on the ink level reaches a predetermined ink residue, the ink jet recording apparatus performs a peripheral operation in accordance with the ink residue
- {claim 40} the predetermined ink residue is an ink residue set as ink end, and, when the ink end is detected, the ink jet recording apparatus performs a low ink processing operation
- {claim 41} the ink consumption condition is not measured by the piezo-electric device until the ink residue calculated by the consumption condition calculation process reaches an amount in a neighborhood of the measuring position level

Fumiyuki discloses:

- {claim 4} detection during power-on is common (Detailed Description page 6, lines 48-49)
- {claim 5} ink detection is detected when the recording apparatus is turned off (abstract)
- {claim 37} consumption condition calculation process (Detailed Description page 2, lines 45-51; Detailed Description page 3, lines 1-2)
- {claim 38} ink level is detected based on either a calculated result information of the ink consumption condition in the ink container calculated by the consumption condition calculation process or a measured result information of the ink consumption condition in the ink container measured by the piezo-electric device (Detailed Description page 2, lines 45-51; Detailed Description page 3, lines 1-2)
- {claim 39} when an ink residue on the ink level reaches a predetermined ink residue, the ink jet recording apparatus performs a peripheral operation in accordance with the ink residue (Detailed Description page 2, lines 45-51; Detailed Description page 3, lines 1-2)
- {claim 40} the predetermined ink residue is an ink residue set as ink end, and, when the ink end is detected, the ink jet recording apparatus performs a low ink processing operation (Detailed Description page 2, lines 45-51; Detailed Description page 3, lines 1-2)

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- {claim 41} the ink consumption condition is not measured by the piezo-electric device until the ink residue calculated by the consumption condition calculation process reaches an amount in a neighborhood of the measuring position level (Detailed Description page 2, lines 45-51; Detailed Description page 3, lines 1-2)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Fumiyuki into the invention of Mikinobu so that the ink condition is detected when power of recording apparatus is turned on/off; there is a consumption condition calculation process; ink level is detected based on either a calculated result information of the ink consumption condition in the ink container calculated by the consumption condition calculation process or a measured result information of the ink consumption condition in the ink container measured by the piezo-electric device; when an ink residue on the ink level reaches a predetermined ink residue, the ink jet recording apparatus performs a peripheral operation in accordance with the ink residue; the predetermined ink residue is an ink residue set as ink end, and, when the ink end is detected, the ink jet recording apparatus performs a low ink processing operation; the ink consumption condition is not measured by the piezo-electric device until the ink residue calculated by the consumption condition calculation process reaches an amount in a neighborhood of the measuring position level. The motivation for the skilled artisan in doing so is to gain the benefits of being able to detect during power-on (as was taught above to be common), and to detect and judge an amount of ink residue (abstract; Detailed Description page 2, lines 45-51; Detailed Description page 3, lines 1-2).

6. Claims 6-7, 11, 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mikinobu (JP Pat 0713291) in view of Kato (US Pat 6347853).

Mikonubu discloses:

- {claims 6-7, 11} an ink consumption condition detection method (as taught in claim 1)
- {claims 52} an ink jet recording apparatus (as taught in claim 46)

Mikonubu differs from the claimed invention in that it does not disclose:

- {claim 6} ink container is an ink cartridge loaded on a carriage; ink cartridge is detected during a period in which the carriage is stopped
- {claim 7} ink cartridge is detected after a predetermined time lapses from the beginning of a stop state of the carriage
- {claim 11} ink container is an ink cartridge loaded on a carriage; reconfirming step

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- {claim 52} ink cartridge and recording head are loaded on the carriage; redetecting the ink consumption condition in the ink cartridge after the piezo-electric device detects absence of ink in the ink cartridge when the recording head is in a non-recording state.

Kato discloses:

- {claims 6} ink container is an ink cartridge loaded on a carriage (column 1, lines 61-67); ink cartridge is detected during a period in which the carriage is stopped (column 1, lines 21-25)
- {claim 7} ink cartridge is detected after a predetermined time lapses from the beginning of a stop state of the carriage (column 1, lines 21-25; predetermined time lapse is inherent to the invention)
- {claim 11} ink container is an ink cartridge loaded on a carriage (column 1, lines 21-25); reconfirming step (column 2, lines 1-5)
- {claim 52} ink cartridge and recording head are loaded on the carriage (column 1, lines 61-67); redetecting the ink consumption condition in the ink cartridge after the piezo-electric device detects absence of ink in the ink cartridge when the recording head is in a non-recording state (column 2, lines 1-5)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Kato into the invention of Mikinobu so that the ink container is an ink cartridge loaded on a carriage; the ink cartridge is detected during a period in which the carriage is stopped; the ink cartridge is detected after a predetermined time lapses from the beginning of a stop state of the carriage; the ink container is an ink cartridge loaded on a carriage; there is a reconfirming step; the ink cartridge and recording head are loaded on the carriage; redetecting the ink consumption condition in the ink cartridge after the piezo-electric device detects absence of ink in the ink cartridge when the recording head is in a non-recording state. The motivation for the skilled artisan in having the ink container on the carriage and stopping the carriage is to gain the benefit of being able to move the ink cartridge to a detection position (column 1, lines 21-25). The motivation for the skilled artisan in having a reconfirming/redetecting step is to gain the benefit of minimizing erroneous ink level determinations (column 2, lines 12-15).

7. Claims 10, 49-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mikinobu (JP Pat 07137291) in view of Matsuzaki et al (US Pat 6416152).

Mikinobu discloses, with respect to claims 10 and 49-50, an ink cartridge (figure 1); an ink consumption condition detection method (as taught in claim 1)

Mikinobu differs from the claimed invention in that it does not disclose storing information, reading information, and judging whether detection should be executed.

Matsuzaki et al discloses, with respect to claims 10 and 49-50, a semiconductor memory device which stores, reads, and executes (column 1, lines 27-40; detection-judging step is inherent in step where printing is executed under an optimum condition)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the semiconductor memory device disclosed by Matsuzaki et al into the invention of Mikinobu so that there could be storing, reading, and judging steps. The motivation for the skilled artisan in doing so is to gain the benefit of improving the characteristics of ink and a driving signal applied to the print head (column 1, lines 27-30).

8. Claims 12 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mikinobu (JP Pat 07137291) in view of Kato (US Pat 6347853), as applied to claim 11 above, and further in view of Hirotsugu et al (JP Pat 11010909).

Kato discloses, with respect to claims 12 and 53, a consumption condition redetection step of redetecting the ink consumption condition in the ink cartridge in a predetermined timing (column 2, lines 56-60).

Mikinobu in view of Kato differs from the claimed invention in that it does not disclose a carriage moving step of moving the carriage after absence of ink in the ink cartridge is detected by the consumption condition detection step.

Hirotsugu et al discloses, with respect to claims 12 and 53, "even if it is detecting that ink does not remain on the structure of an ink cartridge as shown in drawing 2, record is till possible" (Detailed Description page 8, lines 44-45), thus implying a carriage moving step of moving the carriage after absence of ink in the ink cartridge is detected by the consumption condition detection step, since the carriage moves during recording.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the carriage moving step disclosed by Hirotsugu et al into the invention of Mikinobu in view of Kato so that the carriage is moved after absence of ink in the ink cartridge is detected by the consumption condition detection step. The motivation for the skilled artisan in doing so is to gain the

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benefit of making a recordable amount of ink, even when it is detected that ink does not remain (Detailed Description page 8, lines 46-49).

9. Claims 14 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mikinobu (JP Pat 07137291) in view of Kato (US Pat 6347853) and Hirotsugu et al (JP Pat 11010909), as applied to claims 12 and 53 above, and further in view of Hoisington et al (US Pat 5694156).

Mikinobu in view of Kato and Hirotsugu et al differs from the claimed invention in that it does not disclose that shock is given to the ink cartridge.

Hoisington et al discloses, with respect to claims 14 and 54, a fuse which blows (i.e. shocks; abstract; column 2, lines 1-16)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the fuse disclosed by Hoisington et al into the invention of Mikinobu so that a shock is given to the ink cartridge during movement of the carriage. The motivation for the skilled artisan in doing so is to gain the benefit of preventing unauthorized refilling (abstract).

10. Claims 22-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mikinobu (JP Pat 07137291) in view of Hoisington et al (US Pat 5694156).

Mikinobu discloses, with respect to claims 22-32, an ink consumption condition detection method (as taught in claim 1).

Mikinobu differs from the claimed invention in that it does not disclose:

- {claim 22} measuring timing of the ink consumption condition is controlled on the basis of an operation history of the ink jet recording apparatus
- {claim 23} measuring frequency is increased according to cumulation of operations of the ink jet recording apparatus
- {claim 24} cumulation of operation is a cumulative driving time
- {claim 25} a measurement of the ink consumption condition is executed immediately when the measuring timing of the ink consumption condition comes after a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last
- {claim 26} the measuring timing comes before a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last, measurement is executed immediately after the predetermined time elapses

- {claim 27} the measuring timing of the ink consumption condition comes after a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last, a measuring interval is shortened
- {claim 28} the measuring timing of the ink consumption condition comes before a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last, a measuring interval is increased
- {claim 29} the cumulation of operations is a cumulative driving time of the recording head
- {claim 30} the cumulation of operations is a measuring count of the ink consumption condition
- {claim 31} a history memory installed in the ink jet recording apparatus or the ink container stores at least one of a cumulative time of operations of the ink jet recording apparatus and a cumulative measuring count
- {claim 32} history memory further stores past measurement histories

Hoisington et al teaches:

- {claim 22} measuring timing of the ink consumption condition is controlled on the basis of an operation history of the ink jet recording apparatus (column 3, lines 20-30)
- {claim 23} measuring frequency is increased according to cumulation of operations of the ink jet recording apparatus (column 3, lines 20-30; column 1, lines 61-65; it is inherent to the invention that the measuring frequency depends on the cumulation of operations)
- {claim 24} cumulation of operation is a cumulative driving time (column 2, lines 41-51; column 3, lines 8-30; it is inherent to the invention that the cumulation of operations is a cumulative driving time of a carriage)
- {claim 25} a measurement of the ink consumption condition is executed immediately when the measuring timing of the ink consumption condition comes after a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last (column 3, lines 8-30)
- {claim 26} the measuring timing comes before a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last, measurement is executed immediately after the predetermined time elapses (column 3, lines 8-30)

- {claim 27} the measuring timing of the ink consumption condition comes after a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last, a measuring interval is shortened (column 3, lines 8-30; it is inherent to the invention that the measuring timing depends on the predetermined time, so if the measuring timing of the ink consumption condition comes after a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last, a measuring interval is shortened)
- {claim 28} the measuring timing of the ink consumption condition comes before a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last, a measuring interval is increased (column 3, lines 8-30; it is inherent to the invention that the measuring timing depends on the predetermined time, so if the measuring timing of the ink consumption condition comes before a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last, a measuring interval is increased)
- {claim 29} the cumulation of operations is a cumulative driving time of the recording head (column 2, lines 41-51; column 3, lines 8-30; it is inherent to the invention that the cumulation of operations is a cumulative driving time of the recording head)
- {claim 30} the cumulation of operations is a measuring count of the ink consumption condition (column 3, lines 20-30)
- {claim 31} a history memory installed in the ink jet recording apparatus or the ink container stores at least one of a cumulative time of operations of the ink jet recording apparatus and a cumulative measuring count (figure 2, reference 31; column 3, lines 8-30)

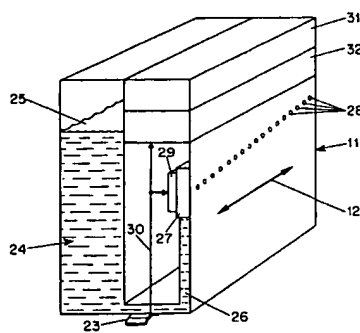


FIG. 2

- {claim 32} history memory further stores past measurement histories

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Hoisington et al into the invention of Mikinobu so that measuring timing of the ink consumption condition is controlled on the basis of an operation history of the ink jet recording apparatus; measuring frequency is increased according to cumulation of operations of the ink jet recording apparatus; cumulation of operation is a cumulative driving time; a measurement of the ink consumption condition is executed immediately when the measuring timing of the ink consumption condition comes after a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last; the measuring timing comes before a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last, measurement is executed immediately after the predetermined time elapses; the measuring timing of the ink consumption condition comes after a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last, a measuring interval is shortened; the measuring timing of the ink consumption condition comes before a predetermined time elapses from a point of time when a carriage on which the recording head is loaded moves last, a measuring interval is increased; the cumulation of operations is a cumulative driving time of the recording head; the cumulation of operations is a measuring count of the ink consumption condition; a history memory installed in the ink jet recording apparatus or the ink container stores at least one of a cumulative time of operations of the ink jet recording apparatus and a cumulative measuring count; history memory further stores past measurement histories. The motivation for the skilled artisan in doing so is to gain the benefit of preventing lost images when the printhead reservoir runs low on ink and which can be refilled and reused without cumulative errors in the quantity of ink contained in the reservoir (column 1, lines 61-65).

11. Claims 42 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mikinobu (JP Pat 07137291) in view of Fumiyaki (JP Pat 10323997), as applied in claim 38 above, and further in view of Hoisington et al (US Pat 5694156).

Mikinobu in view of Fumiyaki differs from the claimed invention in that it does not disclose:

- {claim 42} the measuring frequency of the ink consumption condition by the piezo-electric device is lowered until the ink residue calculated by the consumption condition calculation process reaches an amount in a neighborhood of the measuring position level
- {claim 43} the measuring frequency of the ink consumption condition by the piezo-electric device is increased after the ink residue calculated by the consumption condition

calculation process reaches an amount in a neighborhood of the measuring position level.

Hoisington et al discloses:

- {claim 42} measuring frequency is related to the number of detected drops ejected (column 3, lines 20-30; thus when more drops are ejected, measuring frequency is increased. As taught above in Fumiyaki, most of the drops are not ejected until after the consumption condition calculation process reaches an amount in a neighborhood of the measuring position level. Thus, it is inherent to the invention that the measuring frequency of the ink consumption condition by the piezo-electric device is lowered until the ink residue calculated by the consumption condition calculation process reaches an amount in a neighborhood of the measuring position level).
- {claim 43} measuring frequency is related to the number of detected drops ejected (column 3, lines 20-30; thus when more drops are ejected, measuring frequency is increased. As taught above in Fumiyaki, most of the drops are not ejected until after the consumption condition calculation process reaches an amount in a neighborhood of the measuring position level. Thus, it is inherent to the invention that the measuring frequency of the ink consumption condition by the piezo-electric device is increased after the ink residue calculated by the consumption condition calculation process reaches an amount in a neighborhood of the measuring position level).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Hoisington et al into the invention of Mikinobu in view of Fumiyaki so that the measuring frequency of the ink consumption condition by the piezo-electric device is lowered until the ink residue calculated by the consumption condition calculation process reaches an amount in a neighborhood of the measuring position level; the measuring frequency of the ink consumption condition by the piezo-electric device is increased after the ink residue calculated by the consumption condition calculation process. The motivation for the skilled artisan in doing so is to gain the benefit of preventing lost images when the printhead reservoir runs low on ink and which can be refilled and reused without cumulative errors in the quantity of ink contained in the reservoir (column 1, lines 61-65).

12. Claim 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mikinobu (JP Pat 07137291) in view of Fumiyuki (JP Pat 10323997) and Bullock et al (US Pat 5835817).

Mikinobu discloses, with respect to claim 44, an ink consumption condition detection process (as taught in claim 1).

Mikinobu differs from the claimed invention in that it does not disclose a consumption condition calculation process; ink end or no-end is decided based on an average of a plurality of measured results of the ink consumption condition measured by the piezo-electric device.

Fumiyuki discloses, with respect to claim 44, a consumption condition calculation process (as taught in claim 37).

Bullock et al discloses, with respect to claim 44, ink end or no-end is based on an average of measured results (column 7, lines 37-63).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Fumiyuki into the invention of Mikinobu so that there is a consumption condition calculation process. The motivation for the skilled artisan in doing so is to gain the benefits of being able to detect during power-on (as was taught above to be common), and to detect and judge an amount of ink residue (abstract; Detailed Description page 2, lines 45-51; Detailed Description page 3, lines 1-2).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Bullock et al into the invention of Mikinobu so that ink end or no-end is based on an average of measured results. The motivation for the skilled artisan in doing so is to gain the benefit of being able to store usage information for the printer (column 7, lines 61-63).

13. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mikinobu (JP Pat 07137291) in view of Fumiyaki (JP Pat 10323997) and Bullock et al (US Pat 5835817), as applied to claim 44, and further in view of Hoisington et al (US Pat 5694156).

Mikinobu in view of Fumiyaki and Bullock et al differs from the claimed invention in that it does not disclose that the measuring frequency of the piezo-electric device is lowered until the first passing of the ink level through the measuring position level is measured by the piezo-electric device.

Hoisington et al discloses, with respect to claim 45 that measuring frequency is related to the number of detected drops ejected (column 3, lines 20-30; thus when more drops are ejected, measuring frequency is increased. As taught above in Fumiyaki, most of the drops are not ejected until after the consumption condition calculation process reaches an amount in a neighborhood of the measuring position level. Thus, it is inherent to the invention that the measuring frequency of the piezo-electric

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device is lowered until first passing of the ink level through the measuring position level is measured by the piezo-electric device).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Hoisington et al into the invention of Mikinobu in view of Fumiyaki so that the measuring frequency of the piezo-electric device is lowered until the first passing of the ink level through the measuring position level is measured by the piezo-electric device. The motivation for the skilled artisan in doing so is to gain the benefit of preventing lost images when the printhead reservoir runs low on ink and which can be refilled and reused without cumulative errors in the quantity of ink contained in the reservoir (column 1, lines 61-65).

Allowable Subject Matter

14. Claims 13, 15-21, and 33-35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 13 includes the limitation of "An ink consumption condition detection method...wherein the carriage moving step moves the carriage at a faster speed than a speed for moving the carriage during a recording operation," which was not found, taught, or suggested in the prior arts.

Claim 15 includes the limitation of "An ink condition detection method...wherein the consumption condition redetection step is executed when a predetermined time passes after the carriage moving step ends," which was not found, taught, or suggested in the prior arts.

Claim 16 includes the limitation of "An ink condition detection method...wherein the consumption condition redetection step is executed during moving the carriage by the carriage moving step," which was not found, taught, or suggested in the prior arts.

Claims 17-18 depend on objected claim 16.

Claim 19 includes the limitation of "An ink condition detection method...wherein the reconfirmation step is executed several times during moving the carriage by the carriage moving step, and presence or absence of ink in the ink cartridge is decided on the basis of detection results of the reconfirmation steps," which was not found, taught, or suggested in the prior arts.

Claims 20-21 depend on objected claim 19.

Claim 33 includes the limitation of "An ink condition detection method...wherein...said piezo-electric device measures more number of said periodic peak values than said predetermined number of

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said periodic peak values in subsequent detection of said ink consumption condition, and thereby detects said ink consumption condition," which was not found, taught, or suggested in the prior arts.

Claims 34-35 depend on objected claim 33.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Coudray et al (US Pat 6254212) discloses a method and device for determining the quantity of product present in a reservoir, notably that of ink present in an image forming device.

Mizusawa et al (US Pat 4677448) discloses a recording apparatus with a carriage-mounted ink tank and overflow tank.

Yamanaka et al (US Pat 4977413) discloses an ink remain detector having a flexible member and a liquid injection recording apparatus using the detector.

Kern (US Pat 4196625) discloses a device for monitoring the ink supply in ink recording devices.

Kimura et al (US Pat 4604633) discloses an ink-jet recording apparatus.

Froger et al (US Pat 6089688) discloses a method and device for monitoring the consumption of a product such as an ink, contained in a reservoir.

Suzuki (US Pat 6334658) discloses an ink-jet printer.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leonard S Liang whose telephone number is (703) 305-4754. The examiner can normally be reached on 8:30-5 Monday-Friday.

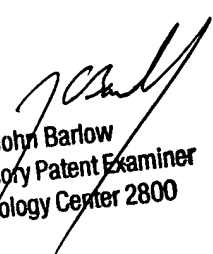
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on (703) 308-3126. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7724 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

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October 4, 2002


John Barlow
Supervisory Patent Examiner
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